



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

A novel algorithm called Unique Brain Network Identification Number (UBNIN) was proposed to encode brain networks of individual subject. The numerical representation (UBNIN) was observed to be distinct for each individual brain network. Also, patterns of disconnectivity were tested in Parkinson's disease (PD) patients to study the variation in network topology over age. Significantly different clustering coefficient was noted in PD between different age-cohorts. To address heterogeneity in PD, grey matter information in neuroimaging (MRI)- based data-driven approach was used and clinical features were correlated to find association between imaging and clinical features. This study also explores if the deciphered subtypes had differences in connectivity pattern amongst them. To analyse this, graph-theory based network analysis was performed based on connectivity metrics. Three subtypes were found with differences in frontal and temporal gyrus regions of brain. Furthermore, realizing the fact that PD is also associated with white matter atrophy in addition to grey matter, subtyping of PD only patients were attempted by fusing both grey and white matter tissue information in a joint ICA framework. The brain networks of these deciphered subtypes were then analysed using association matrices based on correlation between both tissue volumes. The adjacency matrices were obtained by binarizing using mutual K-nearest neighbor (MKNN) based thresholding. Three subtypes were found based on joint loading parameter. Further, upon associating the subtypes with the motor features, they were termed as mild PD, intermediate PD and severe PD.